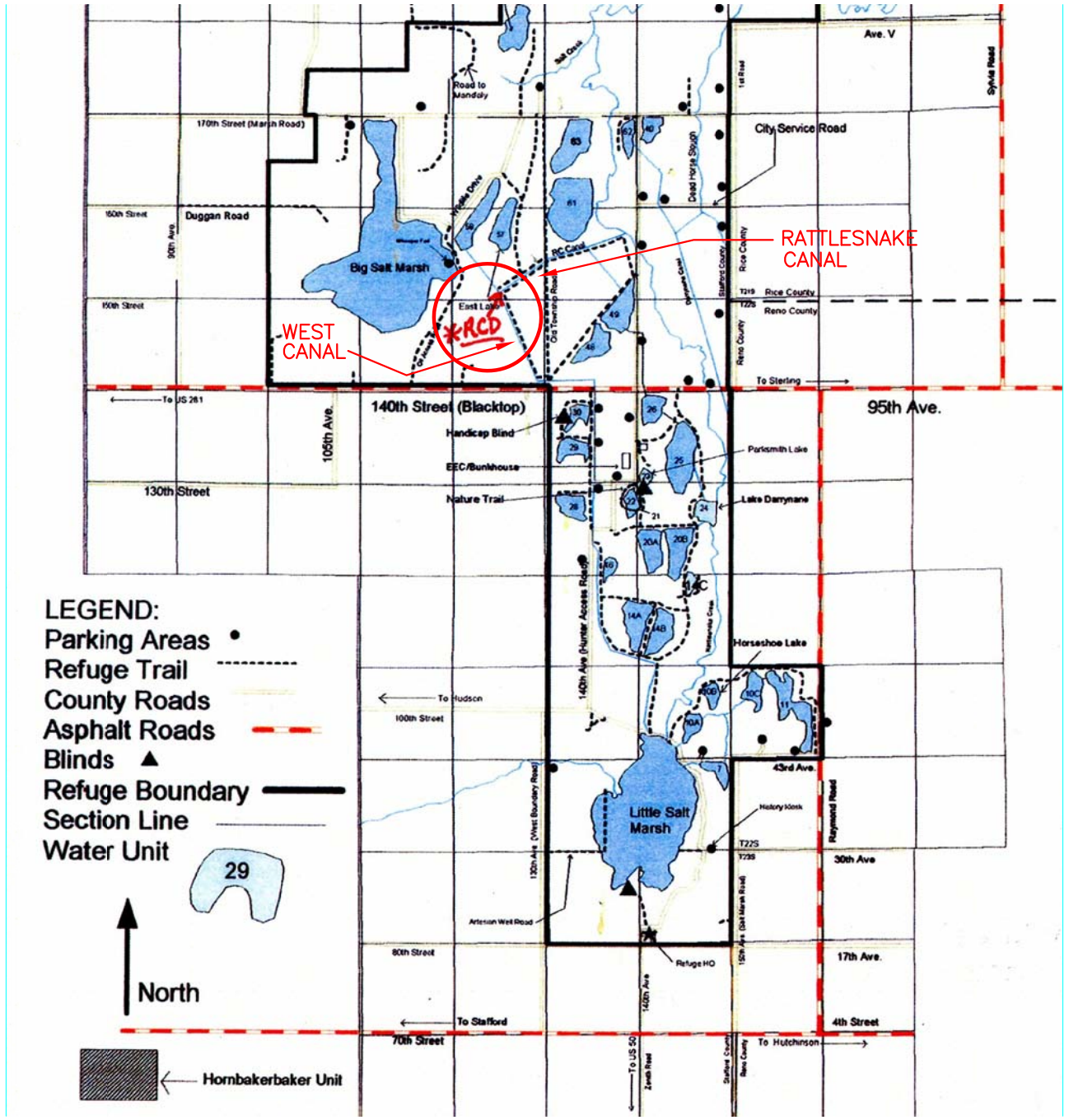
U.S. FISH & WILDLIFE SERVICE

QUIVIRA NATIONAL WILDLIFE REFUGE

REPLACE DIVERSION STRUCTURE D



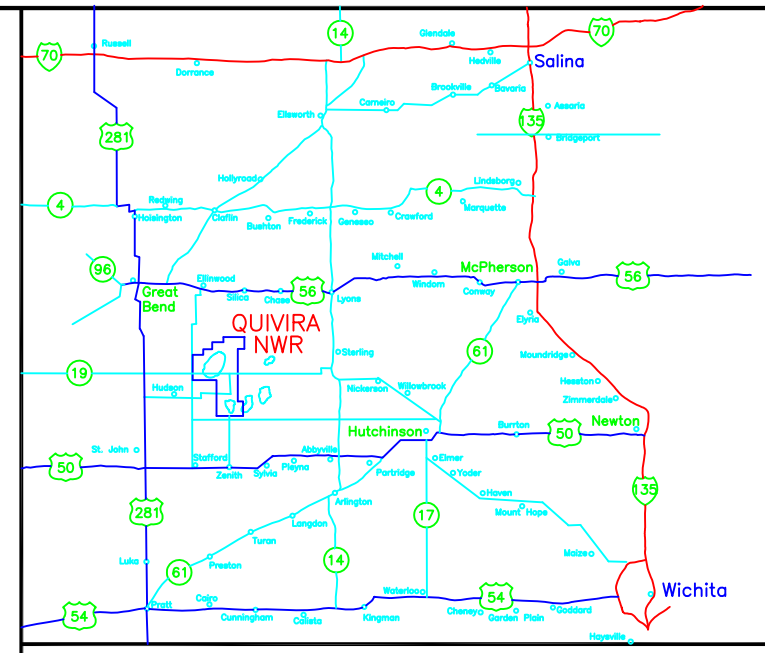
SITE MAP
NO SCALE

NOTES:

1. PROJECT SITE LOCATED INSIDE CIRCLE MARKED AS *RCD ON SITE MAP

   REFER TO SHEET 2 FOR VIEWS OF EXISTING STRUCTURES AND DEMOLITION REQUIREMENTS. EXISTING STRUCTURES INCLUDE DIVERSION STRUCTURE D, LOCATED WITHIN RATTLESNAKE CANAL, CONCRETE SIDE SLOPE PANELS, AND A CIRCULAR CULVERT, LOCATED UPSTREAM WITHIN THE WEST CANAL.

   DIVERSION STRUCTURE D SHALL BE REMOVED AND REPLACED AT ESSENTIALLY THE SAME LOCATION AS THE EXISTING STRUCTURE. THE REPLACEMENT STRUCTURE SHALL BE DESIGNED TO OPERATE AS A WATER CONTROL STRUCTURE AND CREATE A VEHICLE BRIDGE ACROSS RATTLESNAKE CANAL. REFER TO SHEETS 2 THROUGH 7 FOR CONSTRUCTION DETAILS.



VICINITY MAP
NO SCALE

DRAWING INDEX

SHEET NO.	DRAWING TITLE
1 OF 7	VICINITY MAP, SITE PLAN, AND DRAWING INDEX
2 OF 7	EXISTING STRUCTURES – PHOTOS
3 OF 7	REPLACEMENT STRUCTURE – PLAN VIEW
4 OF 7	REPLACEMENT STRUCTURE – PROFILE VIEW & SECTIONS
5 OF 7	REPLACEMENT STRUCTURE – PLAN & PROFILE VIEW
6 OF 7	REPLACEMENT STRUCTURE – DETAILS
7 OF 7	GUARDRAIL DETAILS

NOTE TO BIDDERS:

ANY PRINT ACCOMPANYING THIS INVITATION TO BID MAY BE A REDUCED REPRODUCTION OF THE WORKING DRAWINGS. IF LINE BELOW DOES NOT MEASURE SIX INCHES IN LENGTH, THE INDICATED SCALES ARE TO BE ADJUSTED ACCORDINGLY.

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
REGION 6 ENGINEERING - DENVER, COLORADO

REGIONAL ENGINEER DATE /s/L.A. Harper 10/21/09	QUIVIRA NATIONAL WILDLIFE REFUGE
PROGRAM SUPERVISOR DATE /s/Dave Linehan 10/23/09	STAFFORD COUNTY KANSAS
ASS'T. REGIONAL DIR. DATE /s/R.A. Coleman 10/27/09	REPLACE DIVERSION STRUCTURE D
DIVISION / INITIALS / DATE	VICINITY MAP, SITE PLAN AND DRAWING INDEX
SAFETY /s/T.B. 10/30/09	
INDUSTRIAL HYGIENIST /s/T.T. for J.J.B 10/30/09	DESIGNED : D. FAZZAN / DRAWN : D. FAZZAN / CHECKED : L. HARPER
CULTURAL RESOURCES /s/M.W. 10/27/09	DATE : 10/2009 / DRAWING NO. : 6R-KS-477-09-130R / SHEET 1 OF 7

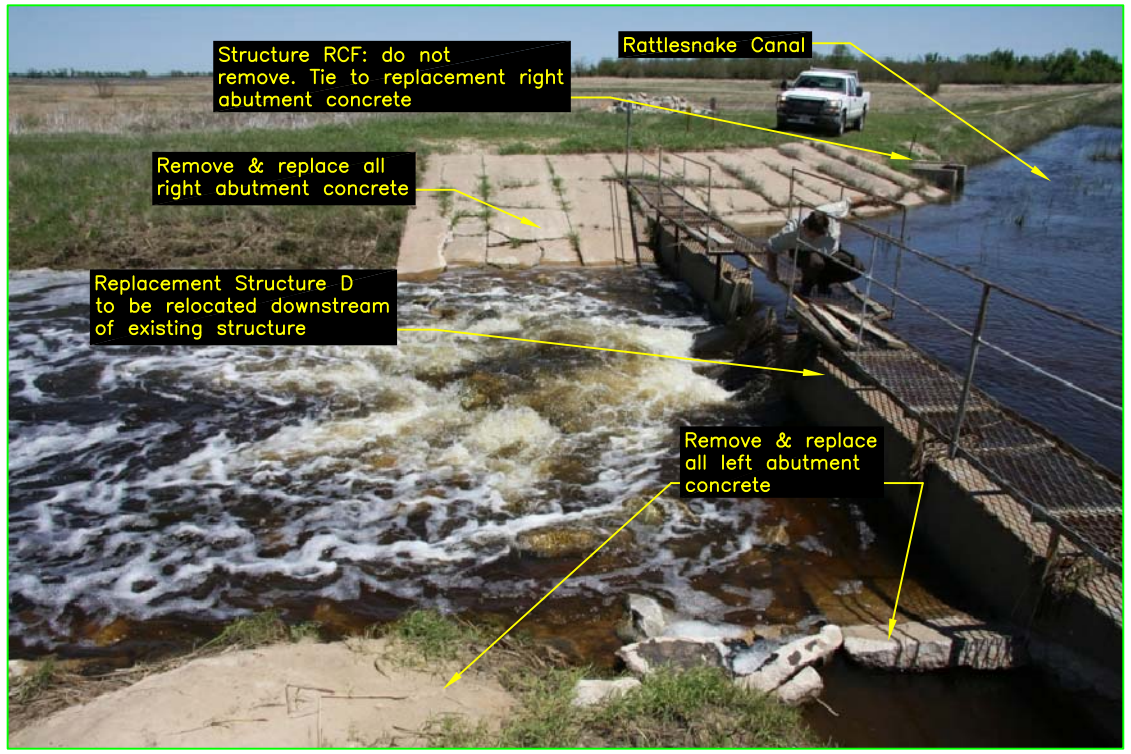


PHOTO 1 – DIVERSION STRUCTURE D

PHOTO 2 – DIVERSION STRUCTURE D

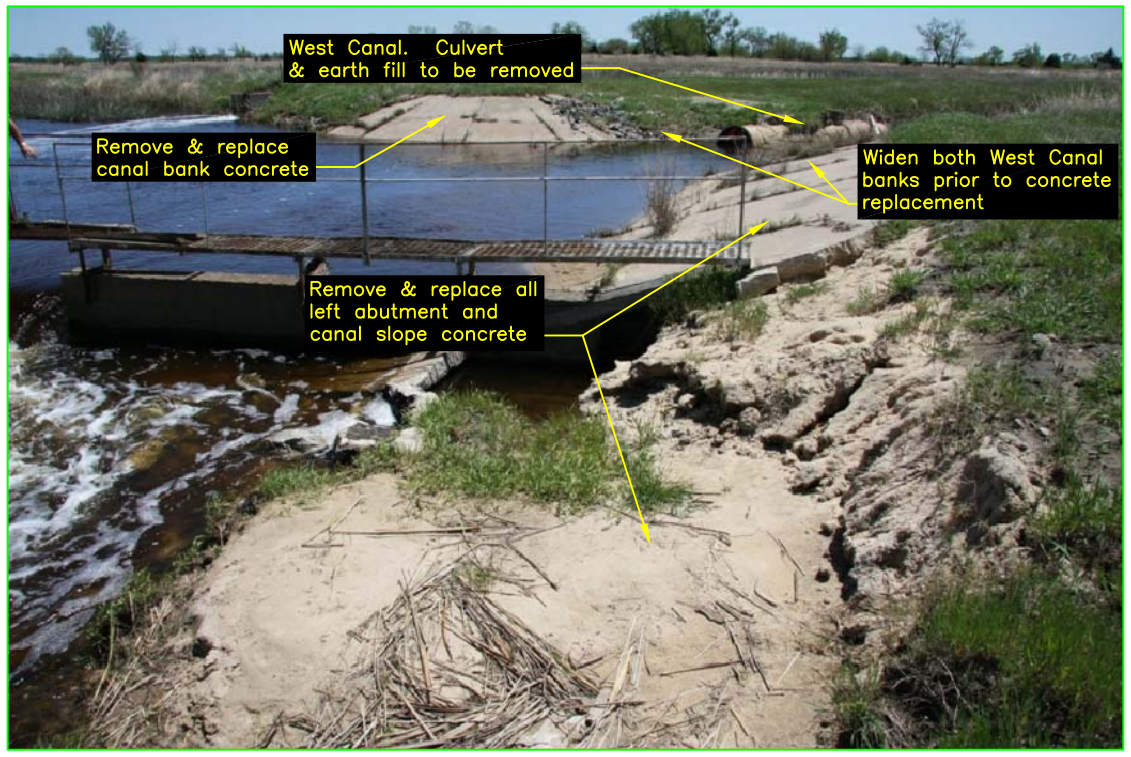


PHOTO 3 – DIVERSION STRUCTURE D

PHOTO 4 – CULVERT IN WEST CANAL

NOTES:

PHOTO NO. 1: VIEW OF EXISTING DIVERSION STRUCTURE D. ALL CONCRETE APPEARS TO BE UNREINFORCED BUT MAY CONTAIN UNKNOWN REINFORCEMENT. CONTRACTOR SHALL DEMOLISH AND REMOVE EXISTING CONCRETE, FOUNDATIONS, AND METALWORK AND DISPOSE OF DEMOLISHED MATERIALS OFFSITE. BROKEN CONCRETE FROM DEMOLITION MAY BE USED AS REPLACEMENT RIPRAP IF IT MEETS THE SPECIFICATIONS FOR RECYCLED RIPRAP. DEMOLITION WORK MAY NOT PROCEED UNTIL A DIVERSION/DEWATERING PLAN IS RECEIVED AND APPROVED BY THE CONTRACTING OFFICER. THE STRUCTURE MARKED "RCF" SHALL NOT BE DISTURBED OR REMOVED AND SHALL BE TIED TO THE REPLACEMENT CANAL BANK CONCRETE ALONG THE RIGHT ABUTMENT BANK. THE REPLACEMENT STRUCTURE D SHALL BE RELOCATED APPROXIMATELY 10 FEET DOWNSTREAM OF THE EXISTING STRUCTURE (REFER TO NOTES, SHEET 3).

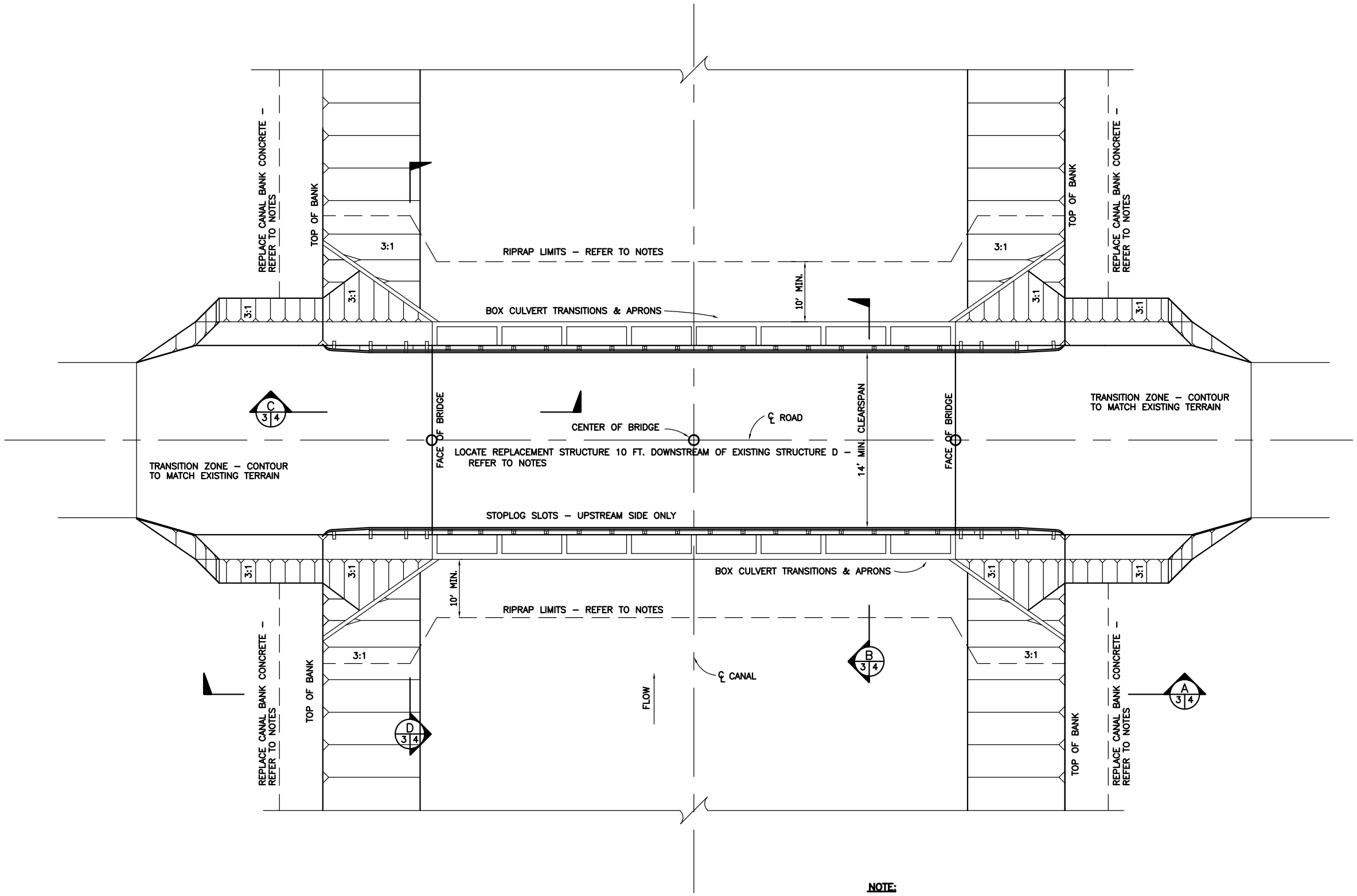
PHOTO NO. 2: VIEW OF EXISTING DIVERSION STRUCTURE D. CANAL FLOWS FROM THE RATTLESNAKE CANAL AND THE WEST CANAL MERGE AT THE TOP OF THE PHOTO. THE RATTLESNAKE CANAL ENTERS FROM THE UPPER LEFT AND THE WEST CANAL ENTERS FROM THE TOP FAR RIGHT,

PHOTO NO. 3: VIEW OF STRUCTURE D, LEFT ABUTMENT AND WEST CANAL AREA. IN ADDITION TO STRUCTURE D, ALL OF THE CANAL BANK CONCRETE SHALL BE REMOVED AND REPLACED AS MARKED ON THIS VIEW. THE WEST CANAL NARROWS AS IT APPROACHES THE INTERSECTION WITH THE RATTLESNAKE CANAL. PRIOR TO REPLACEMENT OF THE CANAL BANK CONCRETE, THE CONTRACTOR SHALL WIDEN THE WEST CANAL CHANNEL TO MAINTAIN CANAL BOTTOM WIDTH INTO THE TRANSITION.

PHOTO NO. 4: CLOSE VIEW OF CIRCULAR FIBERGLASS CULVERT IN THE WEST CANAL. CONTRACTOR SHALL REMOVE THE CULVERT AND ALL EARTH MATERIAL WITHIN THE CANAL PRISM. THE CULVERT PIPE SHALL BE SET ASIDE NEAR THE WEST CANAL FOR REMOVAL BY STATION PERSONNEL. CANAL BANKS SHALL BE REGRADED AND RESTORED TO MAINTAIN CONSISTENT CANAL BOTTOM WIDTH AND SIDE SLOPES THROUGH THIS AREA AND INTO THE CHANNEL AS IT MERGES WITH THE RATTLESNAKE CANAL.

SALVAGED CONCRETE MAY BE USED FOR REPLACEMENT RIPRAP, PROVIDED THE MATERIAL MEETS THE REQUIREMENTS STATED IN THE NARRATIVE SPECIFICATIONS FOR THIS ITEM.

QUIVIRA NWR REPLACE DIVERSION STRUCTURE D	EXISTING STRUCTURES PHOTOS				SUB-SHEET
DESIGNED D. FAZZAN	DRAWN D. FAZZAN	CHECKED L. HARPER	DATE 10/2009	DRAWING NO. 6R-KS-477-09-130R	SHEET 2 OF 7



NOTE:

1. ALL SLOPES, DIMENSIONS, AND ELEVATIONS ARE APPROXIMATE, AND ARE TO BE FIELD VERIFIED.
2. ACTUAL CHANNEL BOUNDARIES MAY VARY FROM THOSE SHOWN.

BRIDGE PLAN
NO SCALE

NOTES:

FINISHED BRIDGE MUST PROVIDE MINIMUM OF 14 FEET CLEARSPAN BETWEEN THE INSIDE SURFACE OF THE GUARDRAILS. CONTRACTOR MAY SUPPLY MULTIPLE STANDARD LENGTH BOX CULVERT SECTIONS TO ACHIEVE THE DESIRED MINIMUM WIDTH.

BOX CULVERT SECTIONS SHALL BE EQUIPPED WITH TRANSITION APRONS FOR EACH OPENING, UPSTREAM AND DOWNSTREAM. APRONS WILL NOT INCLUDE VERTICAL DIVIDER WALLS BETWEEN BOX SECTIONS. MULTIPLE CELL BOX CULVERT SECTIONS MAY BE USED.

UPSTREAM AND DOWNSTREAM END BOX CULVERT SECTIONS SHALL BE EQUIPPED WITH ANGLED WING WALLS. THE HEIGHT AND TAPER OF THE OUTSIDE WING WALLS SHALL BE ADJUSTED TO MATCH THE EXISTING OR MODIFIED TERRAIN AS NEEDED; HOWEVER, WINGWALLS SHALL EXTEND TO A POINT AT OR NEAR THE TOP OF THE CANAL BANK.

REPLACEMENT CANAL BANK CONCRETE SHALL EXTEND TO THE SAME CANAL BANK HEIGHT AS THE EXISTING CANAL BANK CONCRETE. REPLACEMENT CANAL BANK CONCRETE SHALL EXTEND A MINIMUM OF 10 FEET UPSTREAM AND DOWNSTREAM FROM THE OUTER MOST EXTENT OF THE REPLACEMENT STRUCTURE D. RIPRAP SHALL BE PLACED BETWEEN THE STRUCTURE AND THE LIMIT LINES SHOWN FOR THE CANAL BOTTOM. RIPRAP SHALL BE PLACED A MINIMUM OF 5 FEET BEYOND THE REPLACEMENT CANAL BANK CONCRETE ON THE CANAL SIDE SLOPES.

EXISTING CANAL SIDES HAVE AN ESTIMATED SLOPE OF 3:1. FINAL GRADING OF SLOPES ADJACENT TO THE REPLACEMENT STRUCTURE WILL VARY BUT SHOULD BE MAINTAINED AT APPROXIMATELY 3:1 SLOPE.

THE REPLACEMENT STRUCTURE D SHALL BE MOVED DOWNSTREAM RELATIVE TO THE EXISTING STRUCTURE D. THE STOPLOG SLOTS OF THE REPLACEMENT STRUCTURE D SHALL BE LOCATED A DISTANCE OF 10 FEET DOWNSTREAM FROM THE EXISTING STRUCTURE D STOPLOG SLOTS.

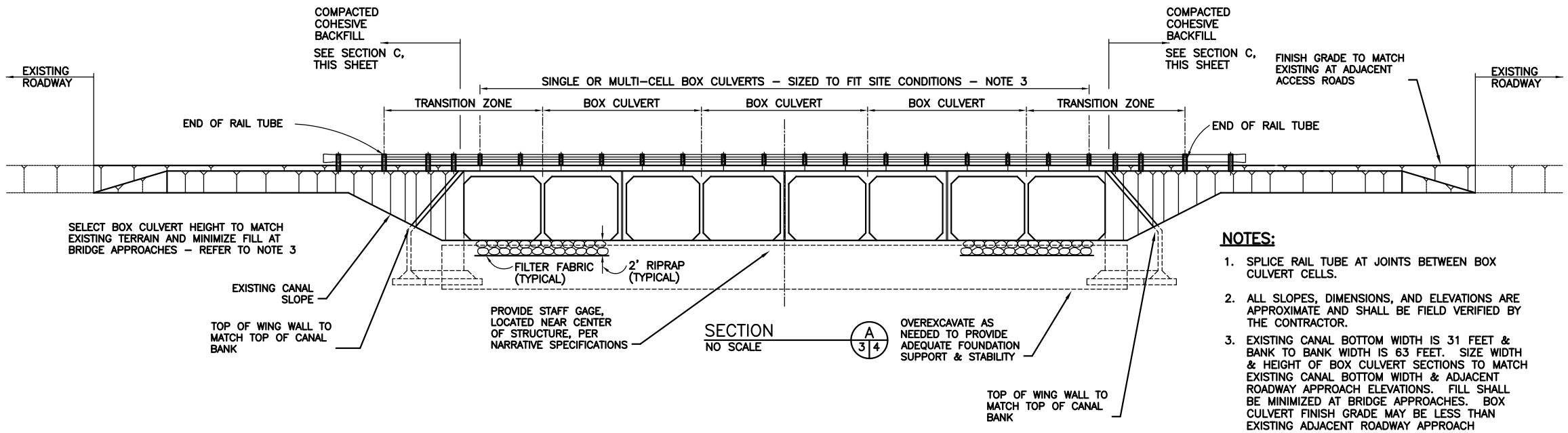
QUIVIRA NWR

REPLACE DIVERSION STRUCTURE D

REPLACEMENT STRUCTURE PLAN VIEW

SUB–SHEET

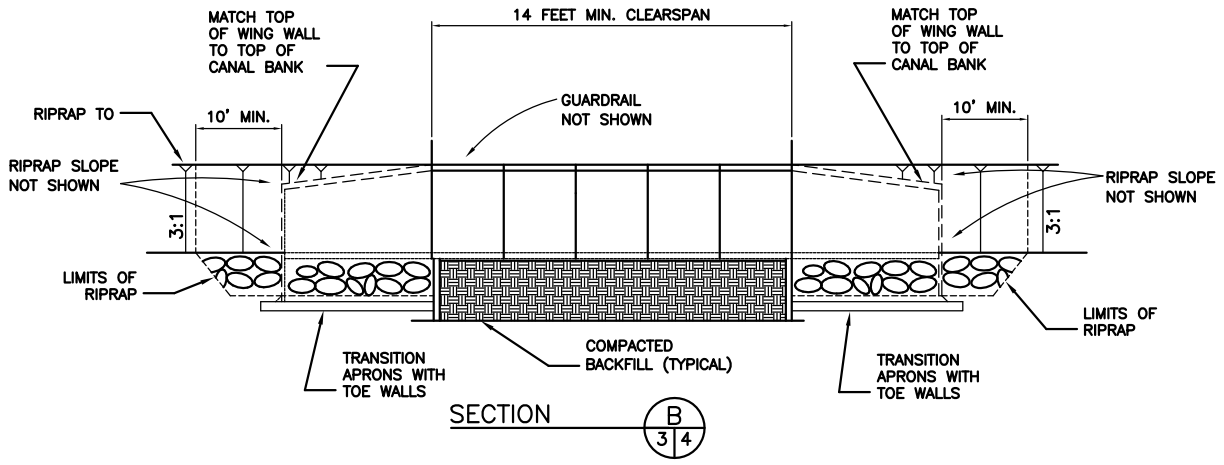
DESIGNED	DRAWN	CHECKED	DATE	DRAWING NO.	SHEET
D. FAZZAN	D. FAZZAN	L. HARPER	10/2009	6R–KS–477–09–130R	3 OF 7



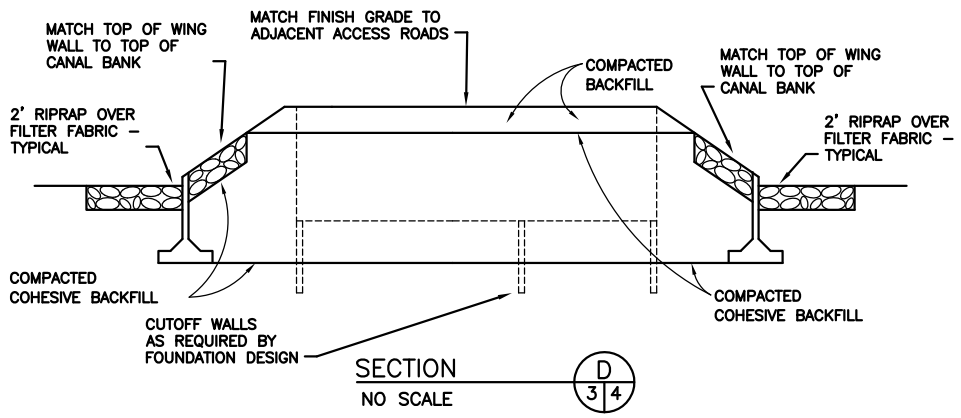
SECTION A 3|4
NO SCALE

NOTES:

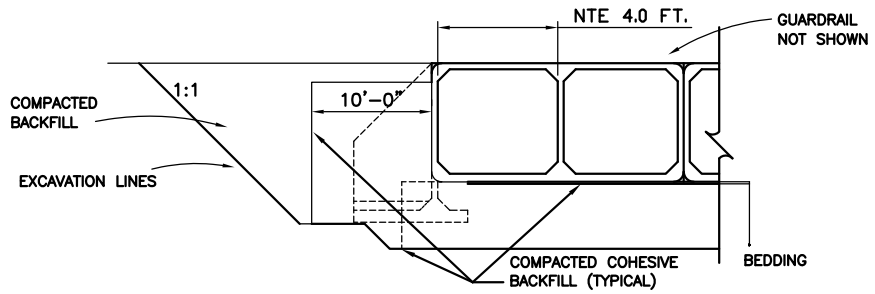
1. SPLICE RAIL TUBE AT JOINTS BETWEEN BOX CULVERT CELLS.
2. ALL SLOPES, DIMENSIONS, AND ELEVATIONS ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR.
3. EXISTING CANAL BOTTOM WIDTH IS 31 FEET & BANK TO BANK WIDTH IS 63 FEET. SIZE WIDTH & HEIGHT OF BOX CULVERT SECTIONS TO MATCH EXISTING CANAL BOTTOM WIDTH & ADJACENT ROADWAY APPROACH ELEVATIONS. FILL SHALL BE MINIMIZED AT BRIDGE APPROACHES. BOX CULVERT FINISH GRADE MAY BE LESS THAN EXISTING ADJACENT ROADWAY APPROACH ELEVATIONS; HOWEVER, APPROACH GRADE SHALL NOT BE LESS THAN -2%.



SECTION B 3|4



SECTION D 3|4
NO SCALE



SECTION C 3|4
(TYPICAL, BOTH ENDS)

NOTES:

FINISHED BRIDGE MUST PROVIDE MINIMUM OF 14 FEET CLEARSPAN BETWEEN THE INSIDE SURFACE OF THE GUARDRAILS. CONTRACTOR MAY SUPPLY MULTIPLE STANDARD LENGTH BOX CULVERT SECTIONS TO ACHIEVE THE DESIRED MINIMUM WIDTH.

BOX CULVERT SECTIONS SHALL BE EQUIPPED WITH TRANSITION APRONS FOR EACH OPENING, UPSTREAM AND DOWNSTREAM. APRONS WILL NOT BE EQUIPPED WITH VERTICAL SEPARATOR WALLS. MULTIPLE BOX CULVERT SECTIONS MAY BE USED. BOX CULVERT OPENINGS SHALL NOT EXCEED 4 FOOT WIDTH.

BOX CULVERT OUTSIDE END SECTIONS SHALL BE EQUIPPED WITH ANGLED VERTICAL WING WALLS. THE HEIGHT AND TAPER OF THE OUTSIDE WALL MAY BE ADJUSTED TO MATCH THE EXISTING OR MODIFIED TERRAIN AS NEEDED.

RIPRAP SHALL BE PLACED BETWEEN THE STRUCTURE AND THE LIMIT LINES SHOWN TO PROTECT THE CANAL BOTTOM AND SIDE SLOPES FROM EROSION.

TRANSITION ZONE: ANGLED WING WALLS SHALL BE ATTACHED TO EACH UPSTREAM AND DOWNSTREAM OUTSIDE BOX CULVERT SECTION.

FOUNDATION CONDITIONS SHALL BE INVESTIGATED UNDER THE DIRECTION OF A REGISTERED PROFESSIONAL GEOTECHNICAL ENGINEER. FINAL FOUNDATION DESIGNS SHALL INCORPORATE METHODS AND MATERIALS TO ENSURE ADEQUATE STABILITY AND SUPPORT FOR THE STRUCTURE UNDER BANK FULL CANAL FLOW CONDITIONS. TOE WALLS AND CUTOFF WALLS SHALL BE INCORPORATED ON ALL APRONS AND BOX CULVERT SECTIONS AS NEEDED.

BOX CULVERT SECTIONS SHALL UTILIZE GASKETED WATERPROOF JOINTS AND ALL SECTIONS SHALL BE TIED TOGETHER BY AN APPROVED ANCHORING SYSTEM. BOX CULVERTS SHALL BE DESIGNED FOR VEHICLE LOADING PER AASHTO HS-20 REQUIREMENTS. NO COVER IS REQUIRED FOR THE BOX CULVERT TOP SURFACE; HOWEVER, ALL VERTICAL JOINTS SHALL BE SEALED FLUSH TO THE TOP SURFACE WITH AN APPROVED PERMANENT SEALANT.

SALVAGED CONCRETE MAY BE USED FOR REPLACEMENT RIPRAP, PROVIDED THE MATERIAL MEETS THE REQUIREMENTS STATED IN THE NARRATIVE SPECIFICATIONS FOR THIS ITEM.

THE CONTRACTOR IS NOT REQUIRED TO SUPPLY STOPLOGS UNDER THIS CONTRACT.

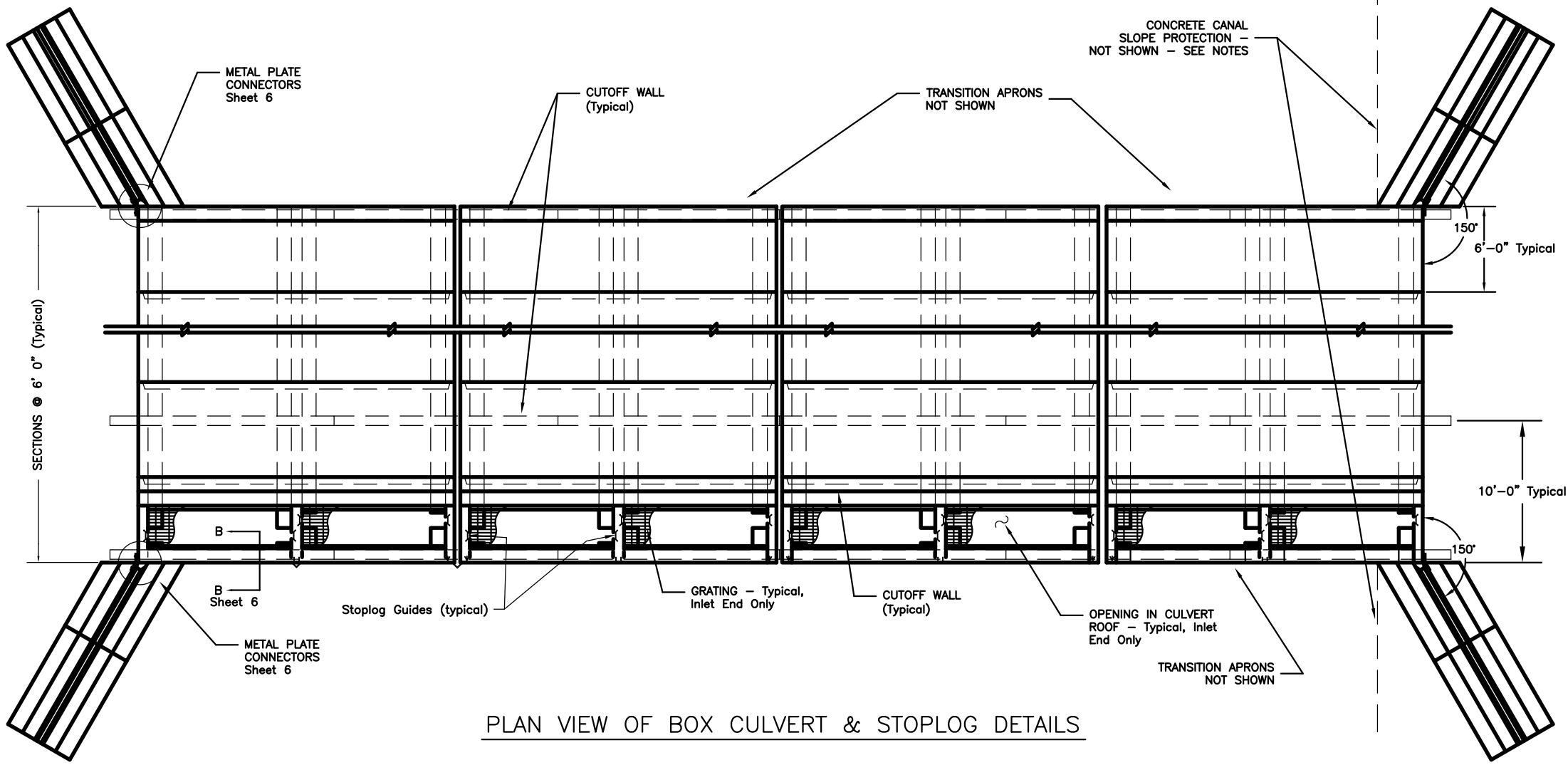
QUIVIRA NWR

REPLACE DIVERSION STRUCTURE D

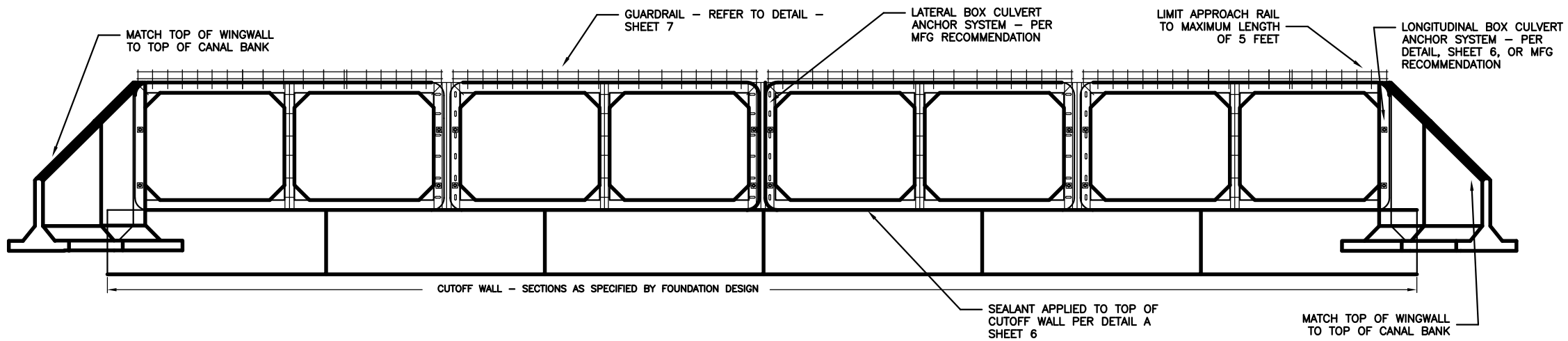
REPLACEMENT STRUCTURE PROFILE VIEW & SECTIONS

SUB-SHEET

DESIGNED	DRAWN	CHECKED	DATE	DRAWING NO.	SHEET
D. FAZZAN	D. FAZZAN	L. HARPER	10/2009	6R-KS-477-09-130R	4 OF 7



PLAN VIEW OF BOX CULVERT & STOPLOG DETAILS



PROFILE VIEW OF BOX CULVERT REPLACEMENT STRUCTURE

NOTES:

WINGWALLS SHALL BE INSTALLED AS SHOWN ON UPSTREAM AND DOWNSTREAM SIDES OF REPLACEMENT STRUCTURE. DEFLECTION ANGLE OF WINGWALLS MAY VARY AS NEEDED TO MATCH EXISTING TERRAIN.

WINGWALL ATTACHMENT TO BOX CULVERT SECTIONS SHALL BE VIA CONNECTOR PLATES OR OTHER APPROVED METHOD PER MANUFACTURER'S RECOMMENDATIONS.

STOPLOG ACCESS PROVIDED BY OPENING IN TOP OF BOX CULVERT. STOPLOG ACCESS OPENING SHALL BE COVERED BY INSET GRATING AS SHOWN. DETAILS OF GRATING SHOWN ON SHEET 6.

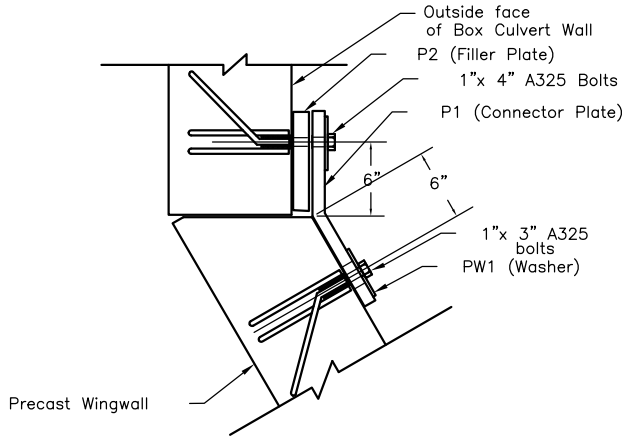
NUMBER OF BOX CULVERT SECTIONS SHALL BE DETERMINED BY ACTUAL SITE DIMENSIONS, TO BE VERIFIED BY CONTRACTOR. SINGLE OR DOUBLE BOX SECTIONS MAY BE USED. BOX CULVERT SECTION LENGTH MAY BE STANDARD 6 FT. OR OTHER LENGTH AS MAY BE AVAILABLE FROM MANUFACTURERS.

CONTRACTOR SHALL PROVIDE A POSITIVE CUTOFF WALL BENEATH THE STRUCTURE AS ILLUSTRATED, OR ALTERNATIVE METHOD, AS PROPOSED BY THE FOUNDATION DESIGNER AND APPROVED BY THE CONTRACTING OFFICER.

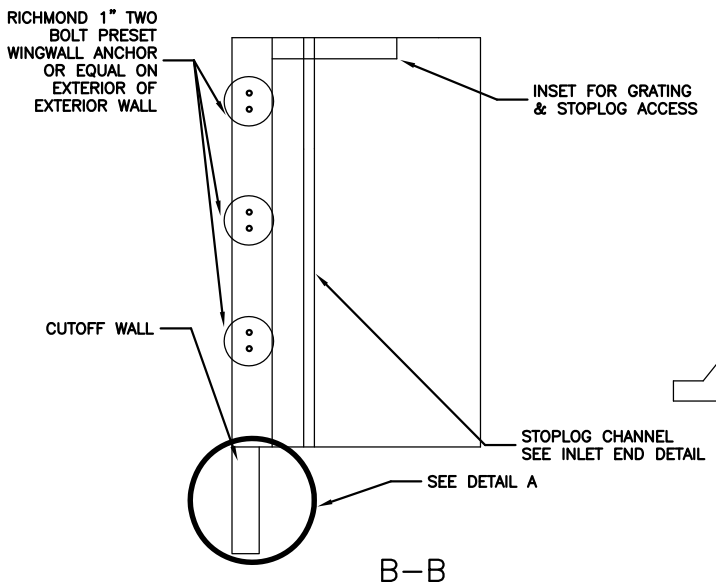
REPLACEMENT CONCRETE CANAL SLOPE PROTECTION SHALL BE PROVIDED IN THE AREAS SHOWN ON SHEET 2. CUTOFF WALLS SHALL BE INCORPORATED BENEATH THE SLOPE PROTECTION SLABS, AS PROPOSED BY THE FOUNDATION DESIGNER AND APPROVED BY THE CONTRACTING OFFICER.

REFER TO SHEET 6 FOR STRUCTURE DETAILS.

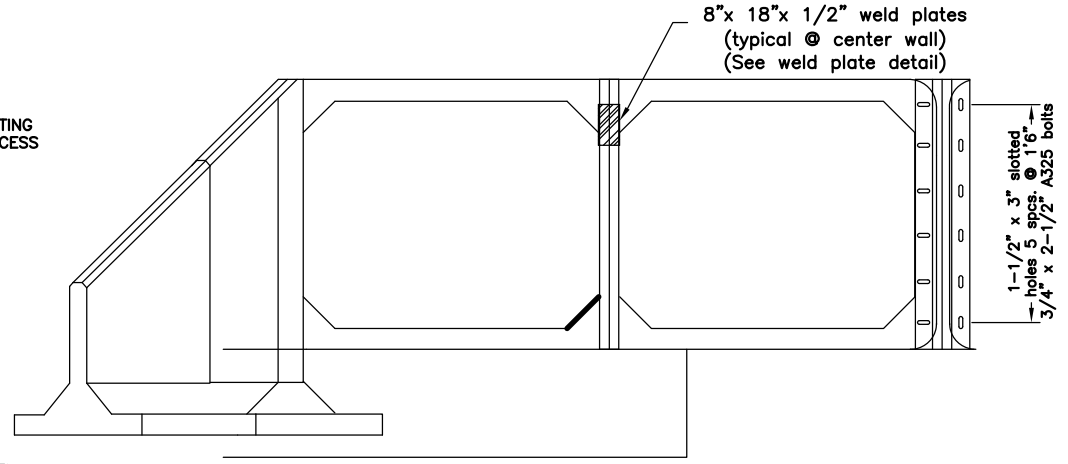
QUIVIRA NWR REPLACE DIVERSION STRUCTURE D	**REPLACEMENT STRUCTURE PLAN & PROFILE VIEW**				SUB-SHEET
DESIGNED D. FAZZAN	DRAWN D. FAZZAN	CHECKED L. HARPER	DATE 10/2009	DRAWING NO. 6R-KS-477-09-130R	SHEET 5 OF 7



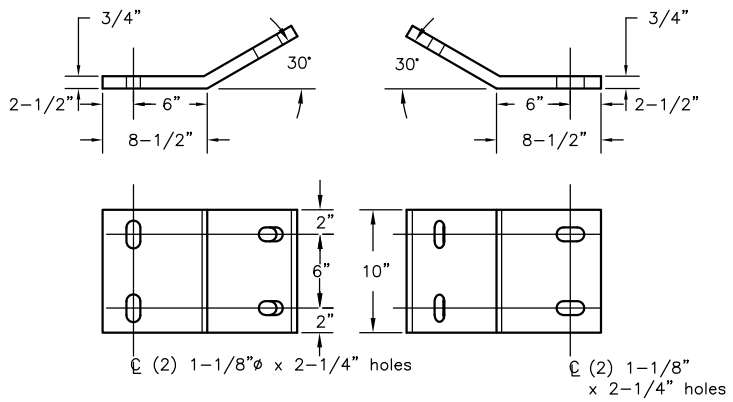
TYPICAL WINGWALL CONNECTION DETAIL



B–B

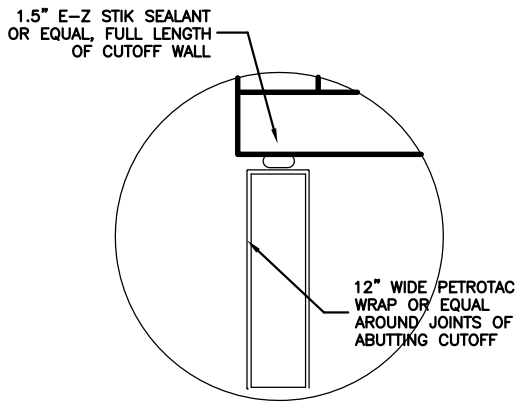


BOX CULVERT END DETAIL

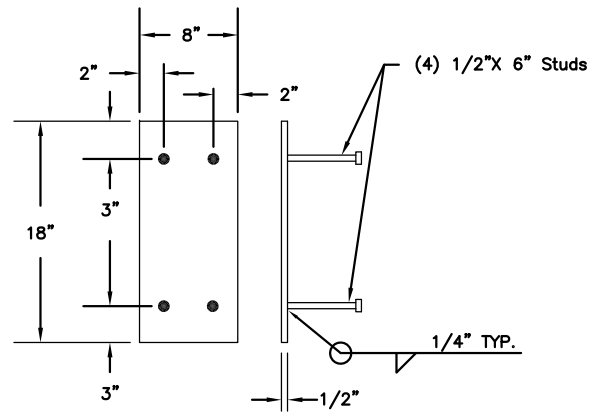


CULVERT LEG WINGWALL LEG

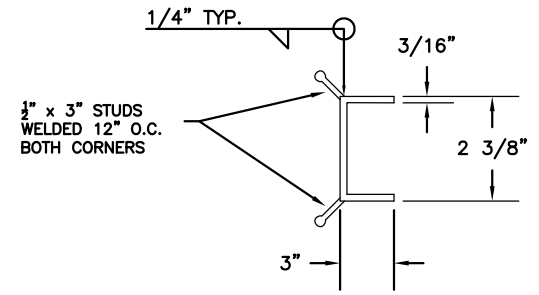
P–1



DETAIL A



WELD PLATE DETAIL



STOPLOG GUIDE

NOTES:

WINGWALLS SHALL BE INSTALLED AS SHOWN ON UPSTREAM AND DOWNSTREAM SIDES OF REPLACEMENT STRUCTURE. DEFLECTION ANGLE OF WINGWALLS MAY VARY AS NEEDED TO MATCH EXISTING TERRAIN.

WINGWALL ATTACHMENT TO BOX CULVERT SECTIONS SHALL BE VIA CONNECTOR PLATES OR OTHER APPROVED METHOD PER MANUFACTURER'S RECOMMENDATIONS. ALL PLATES SHALL BE STAINLESS STEEL.

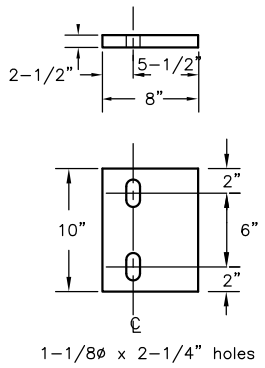
STOPLOG ACCESS PROVIDED BY CAST OPENING IN TOP OF BOX CULVERT. STOPLOG ACCESS OPENING SHALL BE COVERED BY INSET GRATING AS SHOWN. GRATING SHALL BE HINGED TO OPEN AGAINST GUARDRAIL. PROVIDE LATCH TO SECURE GRATING IN OPEN POSITION

NUMBER OF BOX CULVERT SECTIONS SHALL BE DETERMINED BY ACTUAL SITE DIMENSIONS, TO BE VERIFIED BY CONTRACTOR. SINGLE OR DOUBLE BOX SECTIONS MAY BE USED. BOX CULVERT SECTION LENGTH MAY BE STANDARD 6 FT. OR OTHER LENGTH AS MAY BE AVAILABLE FROM MANUFACTURERS.

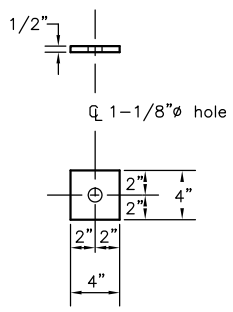
CONTRACTOR SHALL PROVIDE A POSITIVE CUTOFF WALL AS ILLUSTRATED, OR ALTERNATIVE METHOD, AS PROPOSED BY THE FOUNDATION DESIGNER AND APPROVED BY THE CONTRACTING OFFICER.

STOPLOG GUIDES SHALL BE PROVIDED ON SIDES AND SILL OF EACH BOX CULVERT OPENING. GUIDES SHALL BE POSITIONED TO LIMIT STOPLOG LENGTH TO 4 FEET. ALL GUIDES SHALL BE STAINLESS STEEL. STOPLOGS WILL BE GOVERNMENT FURNISHED ITEMS.

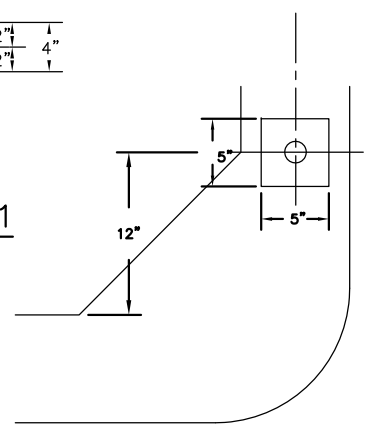
ALTERNATIVE STRUCTURE CONNECTION DETAILS & MATERIALS, PER MANUFACTURER'S REQUIREMENTS, OR OTHER DESIGN, MAY BE SUBMITTED FOR APPROVAL

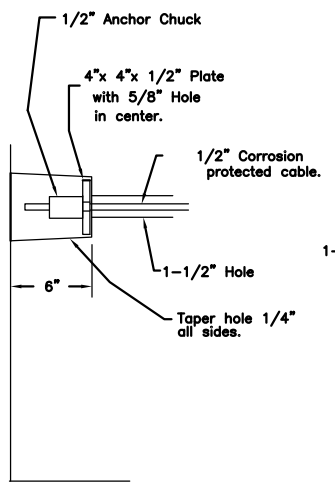


P–2

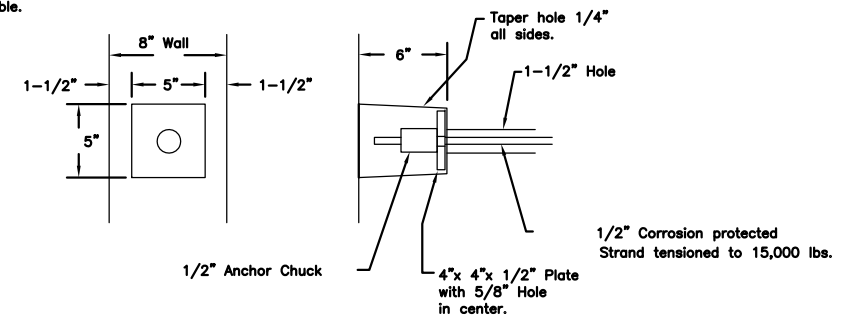


PW–1

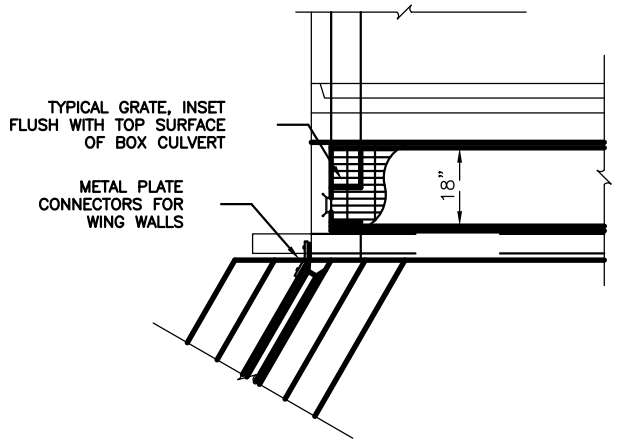




ANCHOR RECESS SHALL BE FILLED WITH A NON–SHRINK, NON–METALLIC, NON–BLEED, GAS–EXPANDING GROUT MIXED AS A DRY PACK. GROUT SHALL BE SUPPLIED BY RCB MANUFACTURER.

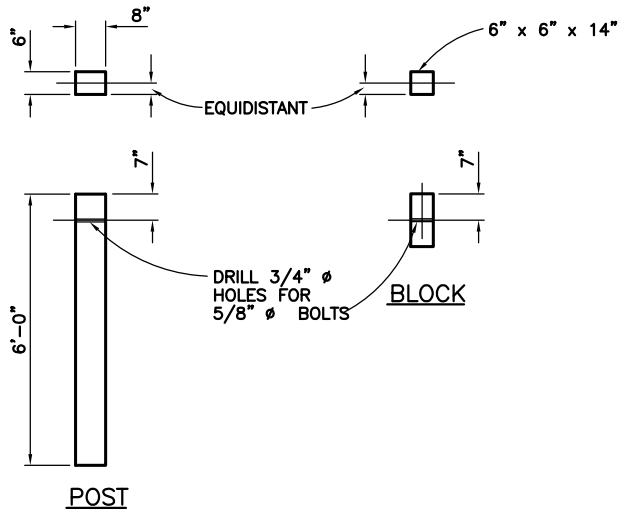


ANCHOR RECESS DETAIL



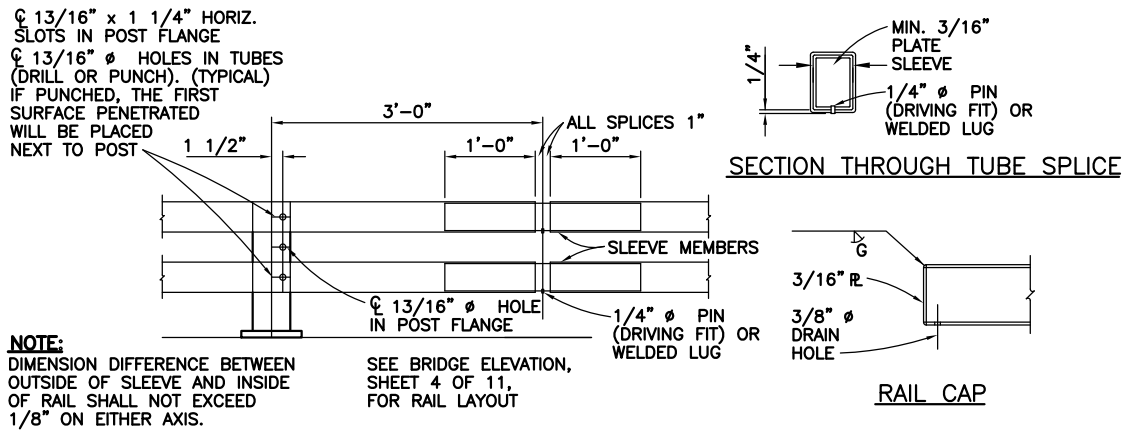
PLAN VIEW – GRATING

QUIVIRA NWR REPLACE DIVERSION STRUCTURE D	**REPLACEMENT STRUCTURE DETAILS**				SUB–SHEET
DESIGNED D. FAZZAN	DRAWN D. FAZZAN	CHECKED L. HARPER	DATE 10/2009	DRAWING NO. 6R–KS–477–09–130R	SHEET 6 OF 7



POST

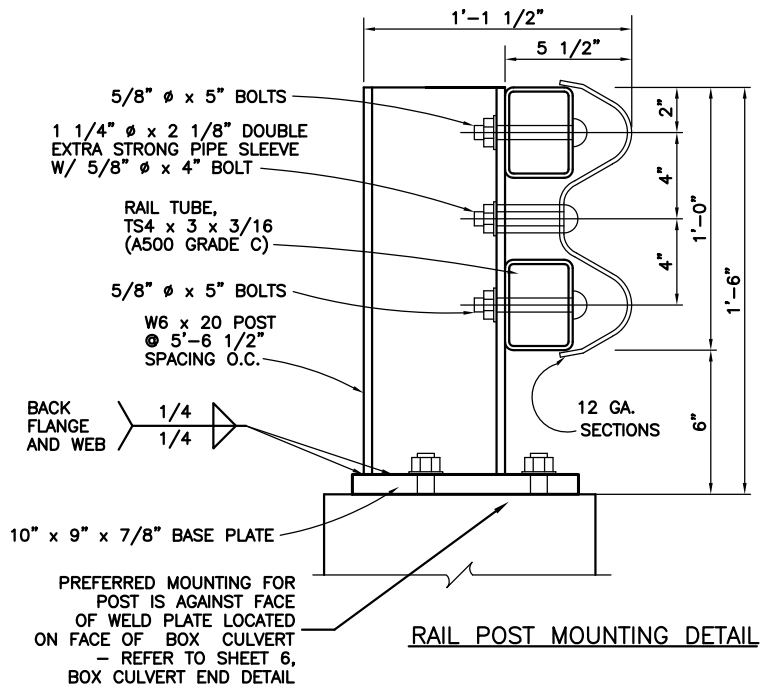
6 x 8 TIMBER POST AND BLOCK DETAIL
NO SCALE



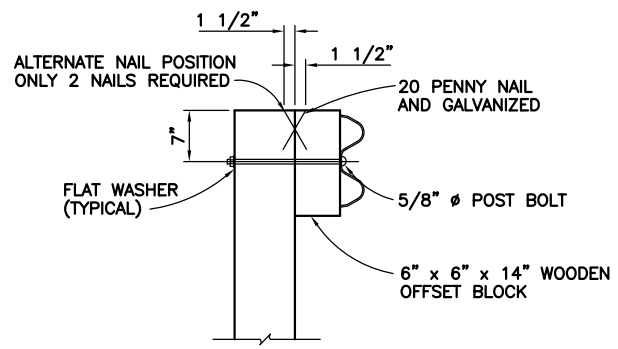
RAIL TUBE SPLICE DETAILS
NO SCALE

SECTION THROUGH TUBE SPLICE

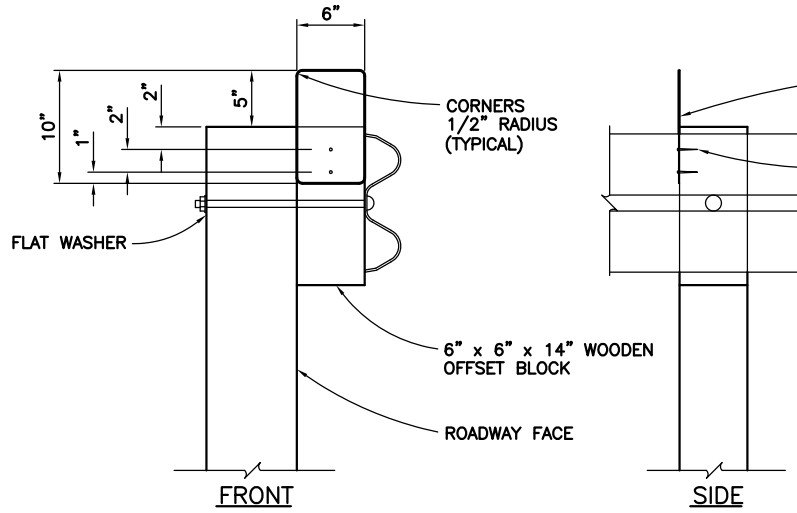
RAIL CAP



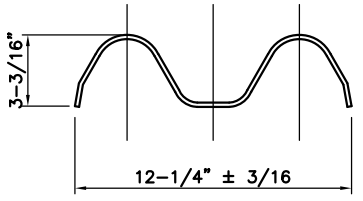
RAIL POST MOUNTING DETAIL



TYPICAL POST ATTACHMENT DETAIL
NO SCALE



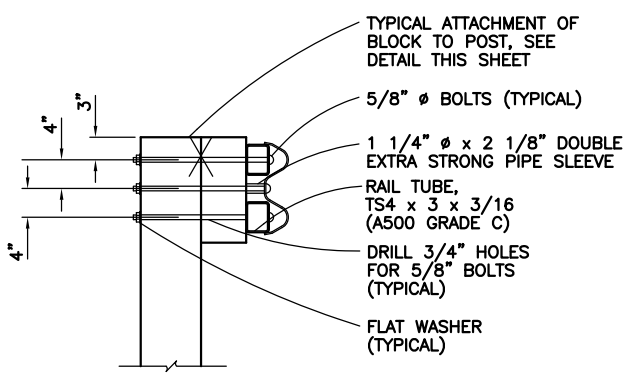
REFLECTORIZED PLATE DETAIL
NO SCALE



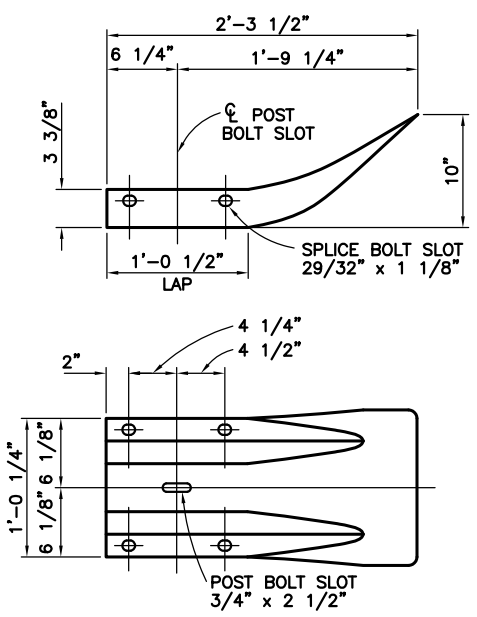
SECTION THRU GUARDRAIL
NO SCALE

NOTES:

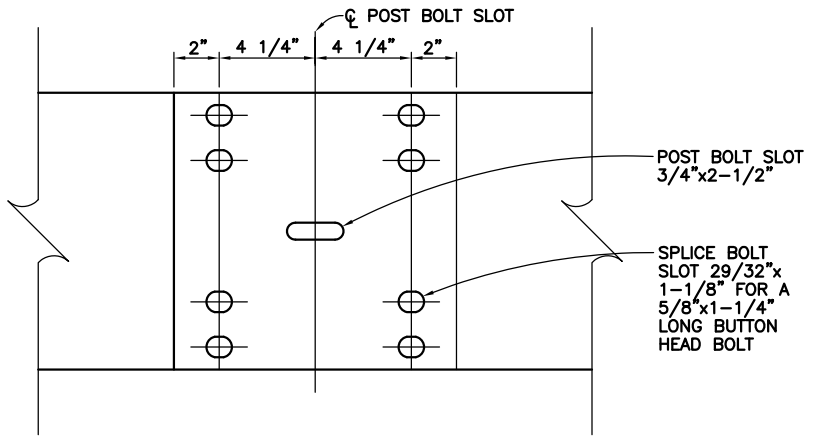
1. BASE PLATES SHALL BE SHOP WELDED TO POSTS BY STEEL FABRICATOR PRIOR TO GALVANIZING. BASE PLATE DETAIL SHOWN IS AN ALTERNATIVE TO THE PREFERRED MOUNTING CONFIGURATION. PREFERRED METHOD IS TO MOUNT THE VERTICAL RAIL POST TO THE WELD PLATE ON THE FACE OF THE BOX CULVERT – REFER TO SHEET 6. THE ILLUSTRATED MOUNTING CONFIGURATION MAY BE USED PROVIDED THE CLEARSPAN AND STOPLOG ACCESS REQUIREMENTS ARE MET.
2. ALL BRIDGE GUARDRAIL COMPONENTS AND SUPPORTING MATERIALS SHALL BE GALVANIZED.
3. REFLECTOR PLATES SHALL BEGIN AT FIRST POST AND SHALL BE INSTALLED ON EVERY OTHER POST.
4. W–BEAM IN BRIDGE RAILING AND APPROACHES SHALL HAVE THE SAME VERTICAL ELEVATION.



RAIL POST DETAIL – APPROACH
NO SCALE



W BEAM END SECTION (FLARED)
NO SCALE



W BEAM CONNECTION
NO SCALE

QUIVIRA NWR

GUARDRAIL DETAILS

SUB–SHEET

REPLACE DIVERSION STRUCTURE D

DESIGNED	DRAWN	CHECKED	DATE	DRAWING NO.	SHEET
D. FAZZAN	D. FAZZAN	L. HARPER	10/2009	6R-KS-477-09-130R	7 OF 7